NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

KEEN OF HAMAR
SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Basic scree (serpentine debris) with RDB beetle *Crysolina intermedia*

Site Details

Site name:	Keen of Hamar
Map:	https://sitelink.nature.scot/site/8279
Location:	Highlands and Islands
Site code:	UK0012815
Area (ha):	39.87
Date designated:	17 March 2005

Qualifying features

Qualifying feature	Assessed condition	SCM visit date	UK overall Conservation Status
Dry heaths	Favourable Maintained	7 October 2010	Unfavourable - Bad
Grasslands on soils rich in heavy metals	Favourable Maintained	24 July 2014	Unfavourable - Bad
Base-rich scree	Favourable Maintained	24 July 2014	Unfavourable - Bad

Notes:
Assessed Condition refers to the condition of the SAC feature assessed at a site level as part of NatureScot's Site Condition Monitoring (SCM) programme.
Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.

Overlapping Protected Areas

Keen of Hamar Special Area of Conservation (SAC) overlaps with most of Keen of Hamar Site of Special Scientific Interest (SSSI) https://sitelink.nature.scot/site/827.

Key factors affecting the qualifying features

Chromite mining

All three qualifying features at Keen of Hamar SAC are profoundly affected by heavy metals from the underlying dunite bedrock and previous mining for chromite ore on this site. Serpentine soils such as those found here are unusual in Scotland. They are found here as a consequence of a localised outcrop of rock with a high heavy metal content. The higher grade chromite ore has been removed from outcrops close to the surface, and mining ceased within the SAC in the middle of the 19th century. The SAC contains several spoil heaps and other disturbed areas as a legacy of this mining. Several tracks and the remains of a mineral tramway run across the site from the Hagdale chromite mine to the north which continued to operate into the 1940s. Recent prospecting for platinum group metals, which are associated with chromite, close to the SAC did not find any ore that was worthwhile to

extract. New technology could potentially reveal economically viable bands of ore adjacent to or beneath the site in future, with the potential for proposals to reopen mines.

Dry heaths

Dry heaths normally occur on acidic soils, but at Keen of Hamar this habitat has formed on a thin, base-rich soil that originated as glacial drift derived from serpentine rocks to the west of the SAC. The alkalinity of the soil is due to high levels of magnesium rather than calcium, which is scarce in serpentine rocks. As a result the soil, although base-rich, is of low fertility so supports heathland rather than grassland. However the base richness allows species normally associated with calcareous grassland to grow making the heathland unusually species-rich. There is also considerable maritime exposure on this site. Strong winds keep the vegetation short (generally <20cm high) and salt spray influences the species that can grow here.

Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning. However, the dry heath at Keen of Hamar SAC is thought never to have been woodland due to the combination of exposure and soil with a toxic heavy metal content.

This site has been largely ungrazed for several decades, but if livestock grazing were to be introduced this would affect the dry heath habitat. There are few contemporary influences on this habitat other than low levels of nitrogen and other pollutants deposited from the atmosphere.

As noted above, any future proposal for new chromite mining in this area could have the potential to affect the dry heath on this site.

Further information about dry heaths can be found here.

Grasslands on soils rich in heavy metals

This habitat comprises sparse vegetation on skeletal soils with high levels of heavy metals such as chromium, nickel and cobalt that are toxic to most plant species. Most of this habitat is near-natural on this site, although it is also found on parts of some of the spoil heaps from the old chromite mine workings.

This site has been largely ungrazed for several decades, but if livestock grazing were to be introduced this would affect the grasslands on soils rich in heavy metals. There are few contemporary influences on the habitat other than frost heave, which causes localised movements of stones and soil, and low levels of nitrogen and other pollutants deposited from the atmosphere. Research on this site has found that low temperatures in late winter and early spring stimulate seed germination of some of the key indicator species. Reduced frost heave in the soils during warmer winters may also make this habitat less hostile to non-specialist species. Consequently, climate change may affect the species composition and vegetation cover in this habitat.

As noted above, any future proposal for new chromite mining in this area could have the potential to affect this feature.

Further information about grasslands on soils rich in heavy metals can be found here.

Base-rich scree

Scree habitats normally consist of rock fragments covering the frost-shattered summits of mountains or accumulating on slopes below cliffs. At Keen of Hamar, this habitat has formed on a gently sloping hillside. There is a high proportion of bare, stony ground with

sparse vegetation. The thin soil has high levels of cobalt, nickel and chromium, heavy metals that are toxic to most plant species.

This site has been largely ungrazed for several decades, but if livestock grazing were to be introduced this would affect the base-rich scree habitat. There are few contemporary influences on the habitat other than frost heave, which causes localised movements of stones and soil and low levels of nitrogen and other pollutants deposited from the atmosphere. Research on this site has found that low temperatures in late winter and early spring stimulate seed germination of some of the key indicator species. Reduced frost heave in the soils during warmer winters may also make this habitat less hostile to non-specialist species. Consequently, climate change may affect the species composition in this habitat.

As noted above, any future proposal for new chromite mining in this area could have the potential to affect this feature.

Further information on base-rich scree habitat can be found here.

Conservation Priorities

Habitat and species distribution is currently mainly determined by soil type and environmental conditions at Keen of Hamar SAC. If there were to be a conflict in management requirements between the three SAC habitats, management that benefits grasslands on soils rich in heavy metals and base-rich scree should have priority over management of dry heath as these features are the primary reasons for site selection.

Conservation Objectives

Overarching Conservation Objectives for all habitat features of Keen of Hamar SAC

1. To ensure that the qualifying features of Keen of Hamar SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or improving the contribution that this site makes to FCS. When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the assessment should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these assessments should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based assessment. Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Keen of Hamar SAC is maintained by meeting objectives 2a, 2b and 2c for all qualifying features

The aim at this SAC is to maintain all qualifying features at favourable condition as a contribution to their wider conservation status. Therefore any impacts on the objectives shown in 2a, 2b, or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on maintaining site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be maintained. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the maintenance of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where there is certainty that the features will be able to quickly recover.

This objective recognises that each qualifying habitat is exposed to a wide range of drivers of change. Some of these are natural and are not a direct result of human influences. Such changes in the habitat's extent, distribution or condition within the site which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site's conservation objectives. An exception to this is when the favourable condition of a habitat is dependent on halting or managing natural succession. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

Conservation Objectives for European dry heaths [H4030] (Dry heaths)

2a. Maintain the extent and distribution of the dry heaths habitat within the site

The area of dry heath should be maintained at approximately 18 ha. The area figure has been taken from the Standard Data Form, and is an estimate because dry heaths form mosaics with the other two SAC habitats on this site. There should be no measurable net reduction in the extent of dry heath and its distribution throughout the site.

The distribution of each of the three SAC habitats within the site is determined by soil type, and this is only expected to change slowly over long periods of time. As long as current management is maintained, any change in the area or distribution of the three SAC habitats that may be identified in subsequent surveys is therefore likely to be due to changes in survey accuracy rather than changes in the area of the three SAC habitats.

2b. Maintain the structure, function and supporting processes of the dry heaths habitat

Dry heaths are normally closely associated with scrub and woodland habitats, which would form the climax habitat in the absence of grazing or cutting of dry heath vegetation. However the thin, toxic soils and maritime exposure prevent tree growth at Keen of Hamar. Rabbits have been the only grazing animals here for several decades, other than an occasional sheep that breaks through the fences that surround the whole SAC.

The structure of dry heath vegetation is usually maintained by light grazing, but livestock have been excluded from this site for several decades to benefit the other two SAC features. In the absence of grazing by livestock, small scale cutting or controlled burning of the dry heath vegetation may need to be considered to prevent build up of dead sedges and domination of the dry heath by single-aged stands of heather *Calluna vulgaris*.

Invasive or non-native species should not be introduced to this habitat.

2c. Maintain the distribution and viability of typical species of the dry heaths habitat
Heather *Calluna vulgaris* is the dominant plant in the dry heath on this site. Other typical species are heaths *Erica* species, crowberry *Empetrum nigrum* and wooly-fringe moss *Racomitrium lanuginosum*. Sedges, such as glaucous sedge *Carex flacca* and green-ribbed sedge *C. binervis,* and wild thyme *Thymus polytricus,* birds-foot trefoil *Lotus corniculatus,* mountain everlasting *Antennaria dioica* and slender St John's wort *Hypericum pulchrum* also grow here. Keen of Hamar is also the only site in Shetland for heath fragrant orchid *Gymnadenia borealis.* The dry heaths on this site provide suitable breeding territories for skylark *Alauda arvensis*. Puffin *Fratercula arctica* and fulmar *Fulmarus glacialis* breed on the cliffs at the edge of this site.

Conservation Objectives for Calaminarian grasslands of the *Violetalia calaminariae* [H6130] (Grasslands on soils rich in heavy metals)

2a. Maintain the extent and distribution of the 'grasslands on soils rich in heavy metals' habitat within the site
The area of 'grasslands on soils rich in heavy metals' should be maintained at approximately 9 ha. The area figure has been taken from the Standard Data Form, and is an estimate because this habitat has gradual transitions to base-rich scree and forms a mosaic with dry heath on this site. There should be no measurable net reduction in the extent of grasslands on soils rich in heavy metals and its distribution throughout the site. The distribution of each of the three SAC habitats within the site is determined by soil type, and this is only expected to change slowly over long periods of time. As long as current management is maintained, any change in the area or distribution of the three SAC habitats that may be identified in subsequent surveys is therefore likely to be due to changes in survey accuracy rather than changes in the area of the three SAC habitats.

2b. Maintain the structure, function and supporting processes of the 'grasslands on soils rich in heavy metals' habitat
The structure and function of the habitat is dependent upon the underlying peculiar and toxic soils. To maintain this habitat type it is important to avoid conversion of these soils to agricultural grassland and avoid reclamation of spoil material. There is sparse vegetation ranging from scattered individual forbs and sedges to a very open sward of fine grasses and sedges with up to about 20% of vegetation cover. There has been no grazing on this site for several decades, other than by rabbits and an occasional sheep that breaks through the fences that surround the whole SAC. Future grazing levels should be low enough to maintain the populations of typical plants (listed in 2c) by allowing each species to successfully grow, flower and set seed. This site is sparsely vegetated due to the toxic metals in the thin soil and the ground is naturally disturbed by frost heave. Frost heave is one of the key factors maintaining grasslands on soils rich in heavy metals on this site as it prevents succession to habitats that require more stable soils. There should be minimal levels of additional disturbance to the ground surface by animal or human activity.

2c. Maintain the distribution and viability of typical species of the 'grasslands on soils rich in heavy metals' habitat
The soil at Keen of Hamar is derived from serpentine bedrock and is rich in magnesium along with the generally plant-toxic nickel, cobalt and chromium. This site has a very distinctive flora, being rich in rare northern species, such as arctic sandwort *Arenaria*

norvegica ssp. *Norvegica* and northern rock-cress *Arabis petraea*. The endemic Shetland mouse-ear *Cerastium nigrescens* var. *nigrescens*, (otherwise known as Edmonston's chickweed) is only found growing on serpentine debris at this site and on the hills to the west.

Other notable species include

Antennaria dioica	mountain everlasting
Anthyllis vulneraria	kidney vetch
Armeria maritima	thrift
Botrychium lunaria	common moonwort
Carex flacca	glaucous sedge
Carex panicea	carnation sedge
Cochlearia spp.	scurvy grasses
Coeloglossum viride	frog orchid
Euphrasia ostenfeldii	eyebright
Linum catharticum	purging flax
Plantago maritima	sea plantain
Rubus saxatilis	stone bramble
Scilla verna	spring squill
Silene acaulis	moss campion
Silene maritima	sea campion
Thalictrum alpinum	alpine meadow-rue
Thymus polytrichus	wild thyme

Many of the species that grow on this habitat type are shade intolerant. Care should be taken when assessing nearby activities that may cause shading e.g., potential future development adjacent to the SAC.

There should be no non-native or invasive native species in this habitat.

Ringed plover *Charadrius hiaticula* breed in this habitat. Puffin *Fratercula arctica* and fulmar *Fulmarus glacialis* breed on the cliffs at the edge of this site.

Conservation Objectives for Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) [H8120] (Base-rich scree)

2a. Maintain the extent and distribution of the base-rich scree habitat within the site

The area of base-rich scree should be maintained at approximately 11 ha. The area figure has been taken from the Standard Data Form, and is an estimate because base-rich scree has gradual transitions to grasslands on soils rich in heavy metals and forms a mosaic with dry heath on this site. There should be no measurable net reduction in the extent of base-rich scree and its distribution throughout the site and the conditions to ensure the habitats' long-term existence are in place.

The distribution of each of the three SAC habitats within the site is determined by soil type, and this is only expected to change slowly over long periods of time. As long as current management is maintained, any change in the area or distribution of the three SAC habitats that may be identified in subsequent surveys is therefore likely to be due to changes in survey accuracy rather than changes in the area of the three SAC habitats.

2b. Maintain the structure, function and supporting processes of the base-rich scree habitat
See 2b for 'grasslands on soils rich in heavy metals'.

2c. Maintain the distribution and viability of typical species of the base-rich scree habitat
See 2c for 'grasslands on soils rich in heavy metals'.

Conservation Measures

Keen of Hamar is notified as a Site of Special Scientific Interest. The land is owned by NatureScot and is managed as a nature reserve.

Current and recommended management for

- **Dry heaths**
- **Grasslands on soils rich in heavy metals**
- **Base-rich scree**

Issue	**Measure**	**Responsible party**
Grazing and browsing	Rabbits have been the main herbivore on this site for several decades, although a few sheep occasionally break into the SAC. Grasslands on soils rich in heavy metals and base-rich scree benefit from minimal levels of grazing, so rabbit numbers should be kept low. The dry heath on this site would benefit from a low level of grazing and browsing by livestock but as the three qualifying habitats grow in a mosaic, grazing management needs to be appropriate for all habitats and any future stocking levels should be kept very low. Agile herbivores (such as goats) should not be introduced to the site.	NatureScot
Muirburn	Small scale, controlled burning of dry heath might be appropriate in future to reduce the build-up of dead sedge in the base of the sward and increase the variation in age/height structure of the heath. Grasslands on soils rich in heavy metals and base-rich scree are too sparsely vegetated to sustain fire, but should not be deliberately burnt.	NatureScot

Cutting of vegetation	Grasslands on soils rich in heavy metals and base-rich scree should not be cut. Small scale cutting of dry heath might be appropriate in future to reduce the build-up of dead sedge in the base of the sward and increase the variation in age/height structure of the heath.	NatureScot
Alien and invasive species	Alien and invasive species should not be introduced to the site. Any agricultural weeds that have been introduced to the site (when cattle were fed silage here or from seeds blown in from adjacent fields) should be removed. There is a potential problem with common mouse-ear *Cerastium fontanum* becoming established and forming tussocks that stabilise the debris and collect "dust", creating patches of closed weedy vegetation. The patches are small at the moment but very numerous so could become a big issue. Some of the worst are associated with rabbit middens.	NatureScot
Habitat damage from vehicle use	Avoid using ATVs or other vehicles in a way that damages habitats and leads to an increase in exposed bare ground.	NatureScot
Erosion	Areas of current erosion should be left undisturbed until the vegetation has recovered.	NatureScot
Soil removal for experimental use	Small scale removal of soil for experimental use is acceptable but should be monitored to ensure that there are no cumulative effects upon site integrity.	NatureScot, researchers
Restoration of areas where soil had been enriched by stock feeding	Soil likely to contain weed seeds in areas that had been heavily trampled and enriched with the remains of silage and dung from cattle has previously been removed from the site on an experimental basis. These areas should continue to be monitored to assess the success of this management. Ongoing localised removal of (historically damaged) turf should continue where appropriate and the success of this restoration management also should be monitored.	NatureScot, researchers
Potential future mining for chromite or other heavy metals	Any future proposals for mining within or adjacent to the SAC should be assessed to determine whether they would affect the integrity of the site.	NatureScot, Planning Authority

Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to understand the long term issues, and to inform future management of the habitat across Scotland. Research bodies should have a local contact they can call upon if undertaking field data collection remotely. This site would be a suitable place to study the effects of climate change upon arctic/alpine plants growing at low altitude.	NatureScot

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